Space Weather Forecast

Issued on Monday, 22 January 2024 at 00:09 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

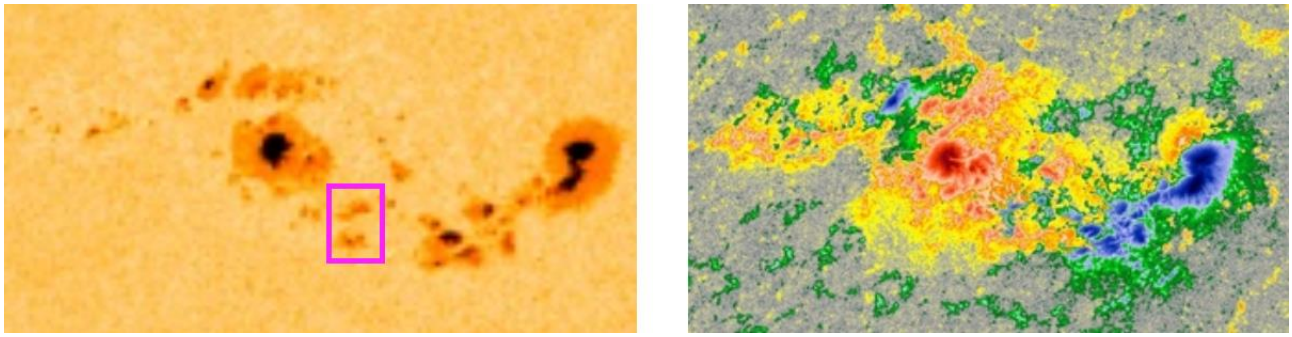
---

Space Weather Forecast Headline: Large Earth-directed CME. Moderate Geomagnetic Storm G2 Likely, Chance G3 Monday 22 January. Risk easing into Tuesday 23 January.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity was low over the UTC day of Sunday 21 January, with occasional Common-class flares observed, largely confined to two episodes that bookended the 24-hour period. These flares peaked at 21/1935UTC with a mid-ranking Common-class flare from the trailing spots of a large and complex sunspot group in the far northeast. This sunspot region has formed at an unusually high solar latitude for this stage of the solar cycle (with a centroid at 27 North), and now spans nearly 20 degrees of solar longitude.

Figure 1: Visible and false-colour magnetic polarity imagery from 21/2300UTC, showing the large sunspot region in the northeastern solar hemisphere. A potentially unstable arrangement whereby two (tenuous) dark opposing polarity sunspots occupy the same vicinity is shown boxed magenta.



This sunspot region was one of eight on the facing side, with a ninth now no longer visible on the western solar horizon. As stated, by far the largest and most complex group is in the northeast, which is showing a congested habit and long chains of intermediate spots. This region underwent strong areal growth in its intermediate and trailing portions, with these spots soon migrating outwards from the centre. Also of note in the period were smaller regions in both the southeast and southwest, which both saw a proliferation of intermediate spots and a spreading tendency.

At 21/0015UTC a 'filament eruption' (arc of plasma) was seen from the northeastern part of the Sun, immediately southeast of the largest sunspot group. This feature has been modelled and determined to pass behind the track of the Earth in its orbit to no effect. During the UTC evening, some unusual activity was noted in extreme UV imagery in the southeast, with a possible footprint identified for a further filament lift-off, although none was identified. No subsequent Coronal Mass Ejection (CME) could be identified in available satellite imagery, however this is being monitored. Other activity in the period was mainly identified with the off-going western solar horizon and the

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2024. All Rights Reserved.

far side. No new Earth-bound CMEs were therefore in evidence.

Solar Wind / Geomagnetic Activity: Solar winds showed a very slight waning tendency over the UTC day in falling from slightly elevated levels to background. This appears to be a slow solar wind regime between minor fast wind enhancements. Accordingly, both the number of particles in the solar wind and their associated magnetic field were within normal background levels.

The net result of the above solar wind measures was for quiet geomagnetic activity throughout.

Energetic Particles / Solar Radiation: No solar radiation storms were observed.

Four-Day Space Weather Forecast Summary

Solar Activity: There is a daily chance of isolated Moderate-class flares, with a roughly level trend given an expected lack of significant arrivals and departures.

Solar Wind / Geomagnetic Activity: The overdue fast wind from a minor 'coronal hole' is now not likely to result in Minor Geomagnetic Storm G1 in the first 24 hours - being slower than anticipated and therefore less impactful. As before, the arrival of the CME from the 20/0840UTC southeast-central filament eruption still carries a most likely arrival time of 22/1800UTC. Moderate Geomagnetic Storm G2 is Likely and with a Chance of Strong Geomagnetic Storm G3, continuing into the first half of the UTC day of Tuesday 23 January before abating to quiet conditions by midweek UTC. At the time of writing, a G3 Watch is valid for 22/1200-23/1200UTC.

Energetic Particles / Solar Radiation: No solar radiation storms are expected, however there is a gradually increasing Slight Chance with the westward advance of some of the more complex groups in the period.

Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	80	50	1	1
Strong	G3	No	30	10	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2024. All Rights Reserved.

Radio Blackouts - X Ray Flares:

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	50	50	50	50
Very Active	R3 to R5 X	No	5	5	5	5

Solar Radiation Storms - (High Energy Protons):

Radiation Storms	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ S1	No	10	10	15	15
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2024. All Rights Reserved.